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Fish Stocking Assessment Of Butternut Lake, 1999

R. J. Zemlak
February 2000

PWFWCP Report No. 213

The Peace/Williston Fish & Wildlife Compensation Program is a cooperative venture of BC Hydro and the provincial fish and wildlife management agencies, supported by funding from BC Hydro. The Program was established to enhance and protect fish and wildlife resources affected by the construction of the W.A.C. Bennett and Peace Canyon dams on the Peace River, and the subsequent creation of the Williston and Dinosaur Reservoirs.

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Website: *www.bchydro.bc.ca/environment/initiatives/pwcp/*

This report has been approved by the Peace/Williston Fish and Wildlife Compensation Program Fish Technical Committee.

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BUTTERNUT LAKE

WATERSHED:	Parsnip River
DATE OF SURVEY:	June 23 and 24. 1999 July 2 and 3. 1999
FIELD CREW LEADER:	Randy J. Zemlak
FIELD ASSISSTANT:	Arne R. Langston

PEACE/WILLISTON FISH AND WILDLIFE COMPENSATION PROGRAM

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FISH AND WILDLIFE BRANCH

REPORT PREPARED BY: RANDY J. ZEMLAK

105-02368/

INTRODUCTION

Butternut Lake is located approximately 34 km south of the town of Mackenzie BC or about 5 km northwest of McLeod Lake BC (Figure 1). The lake has received some attention over the past 10 years from fish biologists with both the Ministry of Environment, Lands and Parks (MELP) and the Peace/Williston Fish and Wildlife Compensation Program (PWFWCP). The PWFWCP conducted a standard fisheries baseline reconnaissance level survey of Butternut Lake in 1990. The results of the survey indicated that the lake contained lake whitefish, longnose suckers, and lake chub. The intent of the survey was to identify potential fisheries enhancement projects, and to identify any possible stocking options. This reconnaissance level report can be viewed at the PWFWCP office (address on cover page).

In 1991, Butternut Lake was first stocked with rainbow trout. This lake has never been assessed since its original stocking of rainbow trout. In 1999, the lake was targeted as a high priority for a fish stocking evaluation as part of the PWFWCP stock assessment program for the Omineca Region. As a result, in June 1999, PWFWCP fish biologists investigated this rainbow trout stocking program.

LAKE LOCATION

Location:	34 km south of Mackenzie BC
Elevation:	± 747 m
Latitude/Longitude:	50° 00' 52" : 123° 05' 40"
U.T.M.:	10.493706.6097175 (NAD 1983)
Management Unit:	7-24
N.T.S. Map No.:	93 - O/11
Watershed:	Parsnip River
Waterbody Identifier:	00120CARP
Lake Drainage:	outlet cr.--->possible subterranean flow--->Holder Cr.--->Pack R.--->Tudyah L.--->Pack R.--->Williston Reservoir (Parsnip Reach)--->Peace R.

ACCESS

Prior to the 1990 reconnaissance survey, there was no road access to Butternut Lake. Some time in 1991, road access was to be established at the north end of the lake through a proposed small business cut block. During the 1999 survey, we confirmed that a road does lead into Butternut Lake.

Figure 1. Location of Butternut Lake.

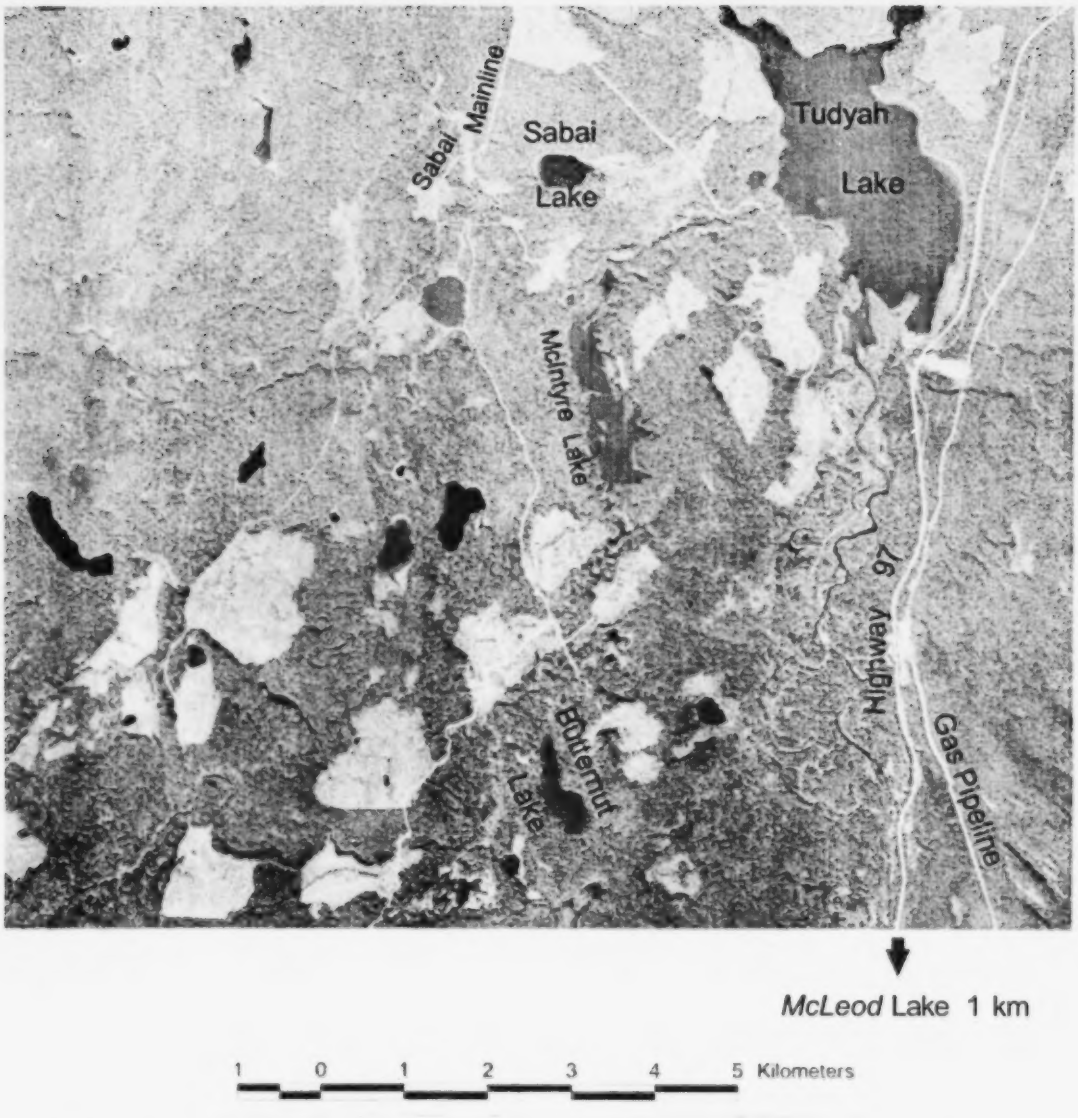

Figure 1. Location of Butternut Lake.

Starting at the junction of Highways 97 and 39, travel 3.0 km south on Highway 97. Turn right onto the Finlay Forest Service Road. This road is a well-used two lane (2 WD) gravel road. Stay on this road for 10.1 km (crossing the Crooked/Pack R. Bridge at km 10.0). After the bridge, turn left and travel on the Sabai Mainline road. This road is also a two-lane (2 WD) gravel road. At km 2, stay right (going left will take you to Tudyah Lake). At km 5.3, stay left at the "Y" intersection. At km 11.05 turn left onto an unmarked road. This road is a smaller, single-lane (2 WD) gravel road. Proceed for 500 m and travel across Holder Cr. (currently a bridge crosses the creek). Travel another 500 m and turn right. At the time of the 1999 survey, a Forest Service sign indicating Butternut Lake Recreation Site was present. Travel another 0.7 km from this sign to the lake. This road eventually ends at a car top boat launch site at the north end of Butternut Lake.

STOCKING HISTORY

Butternut Lake was initially stocked with 10,000 rainbow trout in 1991 (Table 1). Stocking numbers have been relatively consistent with a range of 2,500 to 5,000 yearlings stocked every second year between 1993 and 1999. There have been three different types of stocks introduced into Butternut Lake: Dragon, Pennask, and Tunkwa strains. Of the Pennask stocks, all were female rainbow trout. The range of size for these stocked fish has been from 15.2 g to 25.6 g.

Table 1. Butternut Lake rainbow trout stocking history.

Year	Number	Size (g)	Life Stage	Stock
1991	10,000	0.7	fall fry	Dragon
1993	5,000	3.7	yearling	Dragon/Tunkwa
1994	2,500	25.6	yearling	Pennask
1995	3,000	18.5	yearling	Pennask
1997	3,000	17.1	yearling	Pennask
1999	3,000	15.2	yearling	Pennask

METHODS

Three different techniques were used to determine the relative abundance of the fish species in Butternut Lake. Conversations with MELP fish biologists prior to the gill netting effort suggested that it would be valuable to have at least 10 fish sampled from each age group to accurately provide future recommendations to the stocking program. If this amount of fish were not obtainable, then it was recommended to obtain a minimum of 30 sampled fish

from the population, but more would be preferable (i.e. 50). Therefore, it may have been necessary to keep the nets in the water overnight. Two sinking monofilament experimental gill nets were used (Figure 2). Each net consisted of six different sized mesh panels ranging from 25 to 85 mm. Each panel is 15.23 m long and 2.4 m wide. The gill nets were set in the same locations as the 1990 survey to compare the catches between years. A second method used was Gee traps. Each Gee trap (four in total) was baited with sardines and set overnight. The Gee traps were set in the same locations as the previous survey, in shallow (< 2 m) littoral habitat. The third technique used to capture fish was angling gear. A spin cast rod with an assortment of lures and a fly rod with dry flies was utilized.

The rainbow trout captured were measured for fork length and weight. A biological examination of the fish was conducted which revealed it's sex, maturity, stomach contents, and disease/parasite presence. Scale samples were collected for age determination and the analysis was performed by North/South Consultants (Winnipeg, Manitoba). General appearance of the fish was determined through visual analysis. Mean fork lengths and weights were determined for each age class of rainbow trout. Condition factors ($Weight/Length^3 \times 100$) were determined for each individual fish and for each age class.

All other fish species were enumerated, and most were sampled for fork length and weight. General appearance of these fish was observed and recorded. Some fish were examined for stomach content and sexual maturity. Any non-game fish captured that were still alive in the gill nets were released immediately.

The habitat features of Butternut Lake were briefly assessed. The entire perimeter of the lake was to be observed to confirm the lack of inlet streams. The benchmark established during the original study (1990) was examined. Changes to the current water level was measured with an Abney level, 1.5 m staff, and a 30 m Eslon tape. Any new campsites and other developments built after the original survey in 1990 were also recorded. In addition, an oxygen and temperature profile was recorded at the deepest part of the lake.

On-site anglers were to be interviewed opportunistically and catch per unit effort was recorded. Their catches were sampled in the same manner as described above. Angling efforts by PWFWCP fish biologists were also recorded to determine additional catch per unit effort. One program biologist with three other anglers visited this lake again one week later in early July. This additional catch per unit effort will also be used in this report.

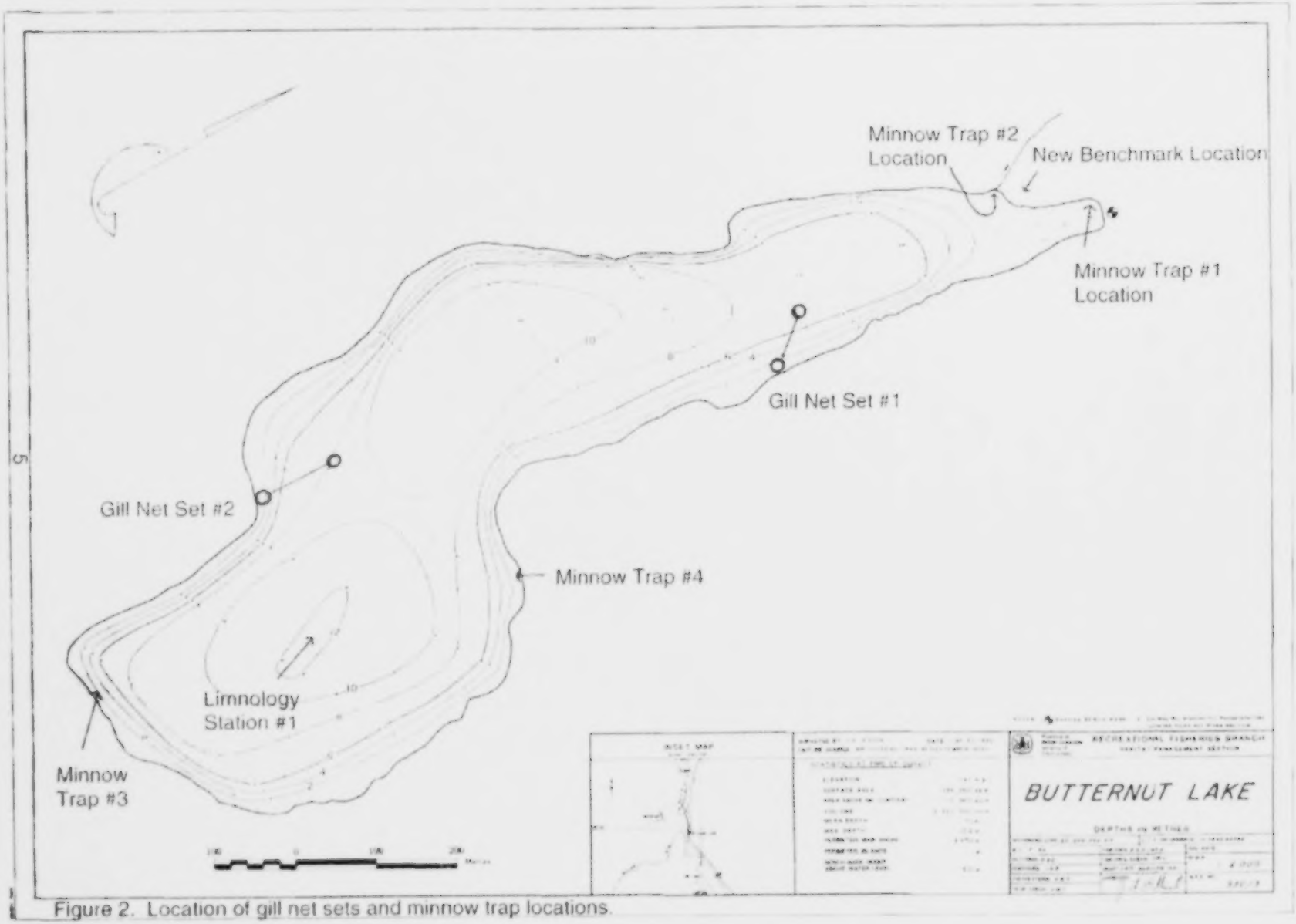

Figure 2. Location of gill net sets and minnow trap locations.

RESULTS

Gill Nets

Two nets were set, one on June 24 and one on June 25, 1999. The nets were not set overnight as the first net set yielded numerous rainbow trout (Appendix 1). Gill net #1, set for 5.67 hours, produced 58 rainbow trout (RB), 17 lake whitefish (LW), and 5 longnose suckers (LSU) (Table 3, Figures 3 and 4). Gill net #2, set for 3.25 hours, produced 10 rainbow trout, 4 longnose suckers, and 3 lake whitefish (Table 3, Figures 3 and 4). The nets were checked periodically (every 1.5 hours) and were cleaned of all fish if there were more than 10 fish present. The nets were then re-set until enough rainbow trout were captured (ideally 50 were targeted between the two days of effort).

Table 3. Gill net catch summary for Butternut Lake, 1999.

Date	Species	Net Site Number		Sampled	Escaped	Size Range (cm)
		1	2			
June 24	RB	58		51	7	13.1 - 43.8
June 24	LW	17		17	0	16.0 - 20.2
June 24	LSU	5		3	2	12.6 - 13.5
June 25	RB		10	9	1	37.0 - 42.0
June 25	LW		3	3	0	18.4 - 36.2
June 25	LSU		4	4	0	11.5 - 45.0

North/South Consultants determined the ages for all rainbow trout and lake whitefish scale samples (Appendix 2). Prints of the scales and age markings were provided for each fish and reviewed by PWFWCP fish biologists. Some errors were detected in the aging of the fish. A further explanation of these errors is mentioned later on in this report.

Angling

On June 25, PWFWCP fish biologists angled for 1.0 hour using two rods and caught one rainbow trout. Catch per unit effort was 0.5 fish per rod hour. This fish (released) was 38.7 cm in length and weighed 624 g. No on site anglers were present during this survey to collect additional information on catch per unit effort. On July 2 & 3, the author and a few friends returned to Butternut Lake to collect more catch per unit effort data. On July 2, 13-rod hours were used to capture 7 fish (6 other fish were lost). Catch per unit effort on this day was 0.54 fish per rod hour. On July 3, 19-rod hours were used to capture 13 fish (7 other fish were lost). Catch per unit effort on this day was 0.68 fish/hr. The two day combined effort was 0.63 fish per rod hour. Only a measure of length and a scale sample was collected for nine of these fish. The data from these angled rainbow trout is also included in Figures 3 and 4.

Lake: **Butternut**

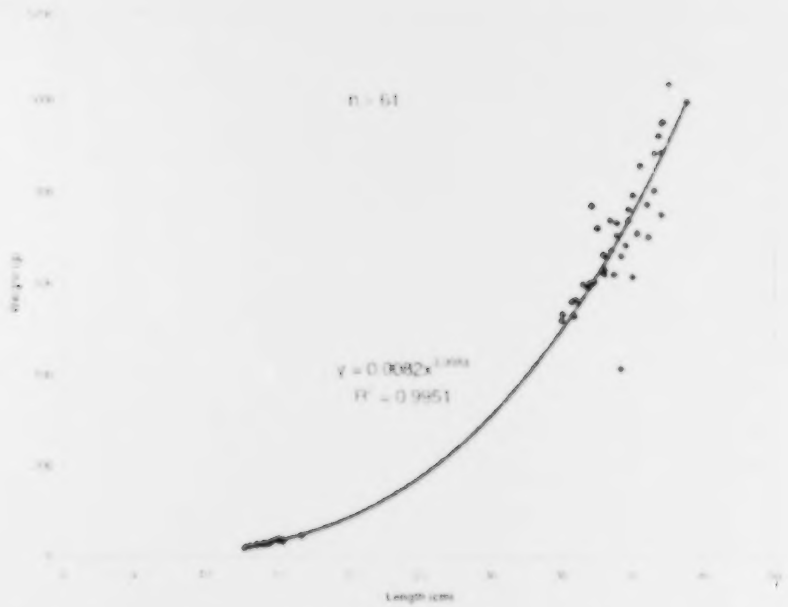

Figure 3. Length versus weight of rainbow trout in Butternut Lake, 1999.

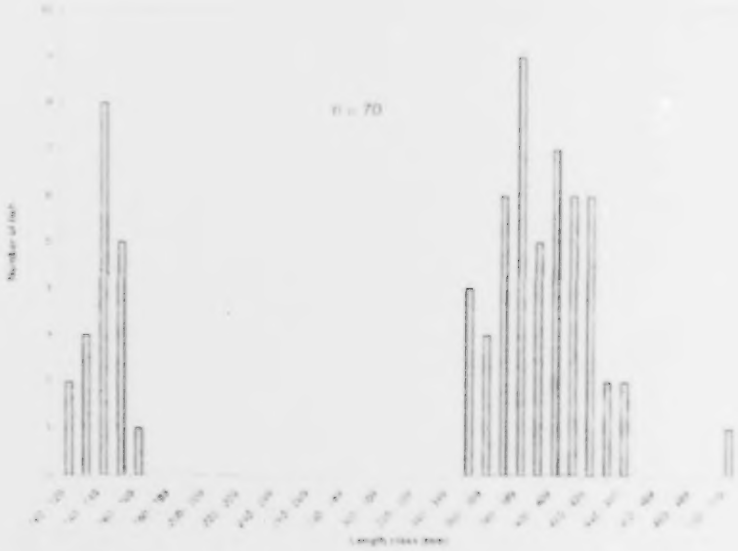

Figure 4. Length frequency distribution of rainbow trout in Butternut L., 1999.

AGING

The aging of rainbow trout and lake whitefish scales were determined by Paul Graveline of North/South Consultants from Winnipeg, Manitoba. These scale readings should be used with some caution as some errors were detected. The majority of the scales were of good quality but there was a discrepancy as to some of the ages. For example, Butternut Lake has been stocked in 1991, 1993, 1994, 1995, 1997, and 1999; therefore, this would suggest that the population of fish would likely be comprised of ages 9, 7, 6, 5, 3, and 1 respectively (assuming no recruitment). During the 1999 assessment, no 2-year old fish were captured, but there were some age 4 fish captured (n = 18). These age 4 readings indicate these fish would have had to be stocked in 1996. Based on the stocking records, the results of this analysis is not possible. Since Butternut Lake does not contain any suitable habitat for the fish to spawn and introductions are unlikely; it seemed as if the scale reading might be incorrect. As a result, the scales were shipped back to North/South Consultants for verification.

Paul and two other scale readers took a sub-sample of 13 fish (ages 3, 4, and 5) and re-read the scales. The other two readers were not notified that there could not be any age 4 fish present. The final results indicated that all three readers agreed on 7 of the scales and that two readers agreed on 8 of the scales. As a result, the readers were still seeing age 4 fish and felt confident that they were correct.

One of Paul's suggestions for the age 4 fish is that there was a slight problem with determining the center of the foci (regenerated). At times, the center of the scale was "blurry" and an annulus could have been missed. Another suggestion was the evidence of a 'less obvious" year mark showing up when looking at the outside annuli. Here, he was suggesting that the fish might be experiencing a decrease in growth (i.e. spawning check). For example, at age three, some of these fish are reaching maturity and want to spawn. These fish generally stop eating during early spring (hence a time of decreased growth) and are expending energy resources into developing gametes. Therefore, an extra "false" annulus appears to be showing up on the outside edge of these presumed aged 4 scales.

Based on the information known about this lake, it was deemed necessary to change the ages of these age 4 fish. With the lake not stocked in 1996 and very little opportunities for the "all females" to spawn in or near Butternut Lake, the age four fish had to be corrected. As a result, all of the age four data were "adjusted" and categorized into either age 3 or 5 (Figure 5). Here, the scales were briefly assessed and the fork length and weight were used to categorize the fish into either age 3 or age 5. These ages should be used with caution as some fish could have been placed into either age category.

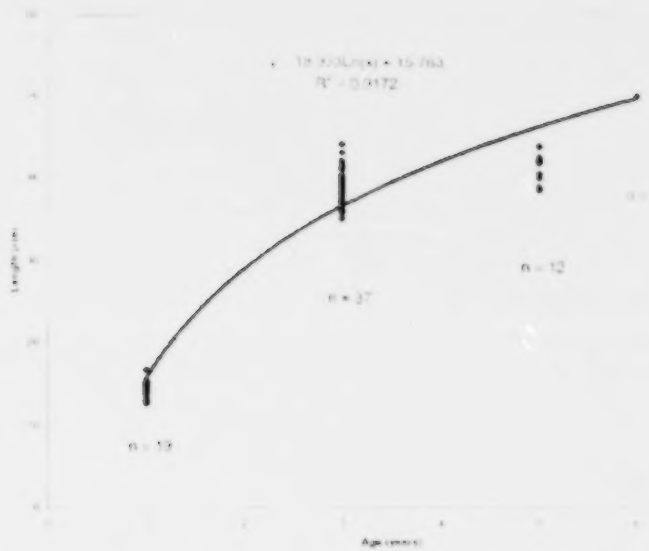

Figure 5. Adjusted age vs. length of rainbow trout in Butternut Lake, 1999.

Fish Population Characteristics

Mean lengths and weights were calculated by age group (Table 4). No age 2 fish were captured which is consistent with the stocking records. The largest aged fish was 6 years old. The average condition factor (Appendix 2) for 42 of the rainbow trout sampled (excluding the age 1 fish) is 1.1799.

Table 4. Population characteristics of rainbow trout in Butternut Lake, 1999.

Age Class	Sample No.	Mean Length (cm)	Range of Length (cm)	SD For Length	Mean Weight (g)	Range of Weight (g)	SD For Weight
1	19	14.3	12.7 - 16.7	0.997	31.8	20.2 - 47.4	6.630
3	37/31[1]	38.9	35.0 - 44.0	2.330	666.0	522-889	100.0
5	12/11[2]	41.3	38.5 - 43.8	1.544	885.6	676 - 1,040	115.878
6	1	50.0	n/a	n/a	?	n/a	n/a

[1] 37 = sample size for length, 31 = sample size for weight.
[2] 12 = sample size for length, 11 = sample size for weight.

Gee Traps

Four Gee (minnow) traps were used to capture juvenile fish. The traps were set overnight (Figure 2) for approximately 24 hours. Two species of fish were captured: lake chub (LKC) and longnose suckers (Table 5). The fish results obtained in 1999 are quite similar to the Gee trapping results of 1990.

Table 5. Gee trap results for Butternut Lake, 1999.

Trap No.	Hours fished	Depth (m)	Substrate	Species	Number	Size Range (mm)
1	24.5	0.7	SWD/organics	LSU	24	43-99
				LKC	74	48-95
2	24.0	0.85	SWD/organics	LSU	13	57-91
			Small gravels	LKC	61	50-92
3	23.5	0.9	LWD/SWD	LSU	9	49-83
			and organics	LKC	220	52-103
				Dragonflies		
4	23.5	1.0	SWD and	LSU	23	54-100
			organics	LKC	206	52-95
				Caddisflies		

LWD = large woody debris, SWD = small woody debris

BIOLOGICAL ANALYSIS OF RAINBOW TROUT

A biological analysis was conducted on most of the rainbow trout captured (Appendix 2). Any fish caught in the net that was still alive was released after taking a length, weight, and a scale. All fish sampled were females except for 4 males. This result corresponds to the stocking of all females since 1994. Reproductive organ analysis (from the gill netting effort) revealed that about 2/3 of the females were gravid and spawnbound. The other 1/3 were maturing and a bright silver color. Almost all of the fish angled were maturing.

Examination of stomach contents indicated that rainbow trout are preying primarily on *Gammarus*, some type of winged insect, and probably off of the bottom (green ooze). There was also evidence of dragonflies and mosquitoes in the stomach. External examination indicated healthy fish while internal examination revealed some tapeworms and parasites within the body cavity.

DRAINAGE

Butternut Lake has no inlets and one outlet. The perimeter of the lake was observed for new potential inlets but none were found. The habitat characteristics of the outlet appear to be similar to the 1990 survey. A beaver dam controls the lake level. The dam is approximately 10-m long and 1.2 m high. The dam is not active and there appears to be no visible seepage. There is a second beaver darn below the first one. Both dams are barriers to fish migration. At about 30 m downstream from the outlet, numerous trees have fallen over the creek. The creek has a complete organic bottom and is about 2.5 m wide and 30 cm deep. There was no detectable flow and the creek does not contain any fish values.

Lake: **Butternut**

SUMMER OXYGEN/TEMPERATURE DATA

The oxygen levels in Butternut Lake were examined for anoxic conditions (Table 6). The same location as the 1990 survey was used to compare the data (Figure 2). The 1990 survey was completed on June 22 and the 1999 survey was completed on June 24.

Table 6. Summer oxygen/temperature data.

Depth (m)	O^2 (mg/l) 1990	O^2 (mg/l) 1999	Temperature (°C) 1990	Temperature (°C) 1999
Surface	8.9	9.4	16.9	15.5
1.0	9.2	9.3	16.4	15.5
2.0	9.4	9.2	16.3	15.5
3.0	9.0	9.1	16.2	15.4
4.0	8.4	9.1	15.5	15.1
5.0	8.3	12.2	14.6	12.6
6.0	9.0	13.0	12.8	10.4
7.0	9.4	12.5	10.8	8.5
8.0	9.8	12.3	9.6	7.5
9.0	9.7	**5.2**	9.3	6.8
10.0	9.7	**1.7**	9.2	6.5
11.0	Not taken	**0.4**	Not taken	6.3
11.6	Bottom	Not taken	Bottom	Not taken
12.0		Not taken		Not taken
12.2		Bottom		Bottom

The readings between years are quite similar. The main difference between the two surveys is the oxygen levels in 1999 dropped significantly below the 8.0-m depth. There is no real explanation for the differences in readings other than two separate O_2/Temp meters were used for each survey. In addition, the calibration of these units may have also been slightly different. These overall results do not pose any significant problems to fish survival in regards to the lake's oxygen and temperature.

BENCHMARK

The benchmark was re-located by PWFWCP fish biologists (Figure 2). This benchmark was originally set in 1990, 2.0 m above the lake water level. In 1999, the water level was at 1.66 m, indicating a 34-cm rise in level from 1990. The benchmark was then re-painted orange. This benchmark is located in a 30 cm D.B.H. lodgepole pine tree, 1.0 m from the current water level at the time of this survey. The high water mark was 10 cm.

Since the original benchmark is in a tree that is currently very close to lake level, it is possible this tree could die and fall over in the near future. Therefore, a second benchmark was set. This new benchmark is set 15 m north of the outlet (Figure 2). It is 3.5 m from the waters edge in a 30 cm white spruce tree and set 2.0 m above current lake level. The 10" iron spike was not painted.

FISHERIES MANAGEMENT COMMENTS

Rainbow Trout

The net catch per unit effort for rainbow trout was quite successful. The yearling rainbow trout captured in both gill nets were from the hatchery stocking on June 3, 1999. Gill net #1 produced 10.2 fish per hour while gill net #2 produced 3.08 fish per hour. With these results, overnight net sets were not required to obtain a sample size of roughly 50 fish (not including 1 year olds).

Angling efforts in July captured mostly maturing fish that were not spawnbound. These fish had a bright silver color to them. These fish are providing a good fishery. Other catch per unit effort data is not available for Butternut Lake. No creel surveys have been performed on Butternut Lake; although, angling pressure on this lake is presumed to be relatively high in the winter (Jim Ladds, pers. comm.). In addition, a few residents of Mackenzie do suggest Butternut Lake is a good fishery during this time.

The length versus weight data revealed the rainbow trout were quite rotund (Figure 3). These fish show a high constant "b" value ($W = aL^b$) which indicate that these fish are "chubby". A value over 3 is an indication of fatter sized fish. The fish in Butternut Lake (1999) were showing a 'b' value of 3.0983.

The growth of rainbow trout is quite difficult to assess. With the aging problems previously expressed, making accurate assumptions on this data would be difficult. The length frequency data is a better indication of age classes present in Butternut Lake. This particular graph (Figure 4) shows the age 1 fish comprising the 120-mm to 169-mm range. It appears that the age three fish range from approximately 350 mm in length to about 400 mm in length. The age five fish range in length from about 400 mm to 450 mm. The oldest fish (aged 6) fell in the 500 mm to 509-mm size range.

Butternut Lake supports a relatively healthy population of stocked rainbow trout based on the gill netting efforts. The condition factors for the sampled rainbow trout averaged approximately 1.1799. Some adult fish do contain tapeworms within their body cavity. In addition, there is a problem of spawnbound when most of these fish reach maturity. There is no stream for

these fish to spawn. As a result, these female fish must reabsorb their eggs. A few mature fish were observed near the outlet at the time of the survey looking for an area to spawn. At this site, a small dig site was present about 10 m from the outlet, but no flow was present. This spawnbound problem does not make for a good fishery during springtime.

Lake Whitefish

The competition between the stocked rainbow trout and lake whitefish was not evaluated. Of the 20 lake whitefish captured in this survey, 18 were age 2, one was age 3, and the largest was age 5. When looking at the lake whitefish population from 1990 to 1999, there appears to be a decline in the size of fish in 1999 (Figures 6 and 7). However, this statement can not be made accurately as the 1990 results were obtained from an overnight net set while the 1999 survey only had morning and afternoon net sets. Therefore, comparing this data would not be precise.

Non-game fish

Butternut Lake also supports populations of non-game fish including longnose suckers and lake chub. Although not studied intensively, both populations were abundant and appear to be healthy.

MISCELLANEOUS COMMENTS

1. Vehicle access to Butternut Lake may be restricted soon. The bridge on Houlder Creek is eroding and could eventually become inoperable.

2. There is a Forest Recreation Site on the north shore. A car top boat launch is present. There are three campsites available, each with picnic tables. In addition, there is one outhouse. Large trailers are not recommended, as the turn around site is quite narrow.

3. A large fish tail was present at the boat launch site prior to this survey. The tail was about 15 cm wide indicating about a 2.5 kg rainbow trout was captured by an angler.

4. Numerous organisms were observed at the surface in the water column near the north shore. A small dip net was used to capture them and a sample was taken for voucher specimens. They were sent to UBC for proper identification. The results indicated that three copepod zooplankton called *Heterocope septentrionalis* were present along with an aquatic larval invertebrate called *Chaoborus* (a winged insect). It is assumed that these organisms form a large component of the rainbow trout diet (green ooze).

Lake: **Butternut**

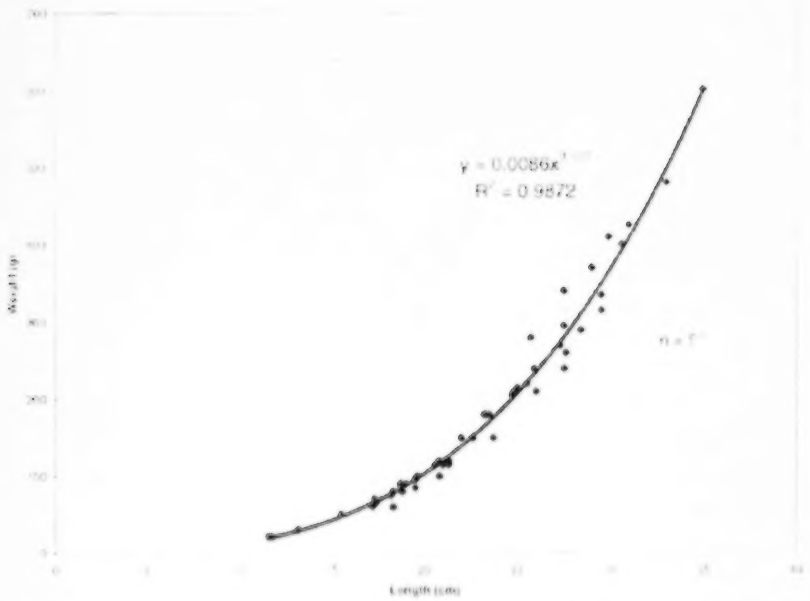

Figure 6. Length versus weight of lake whitefish in Butternut Lake, 1990.

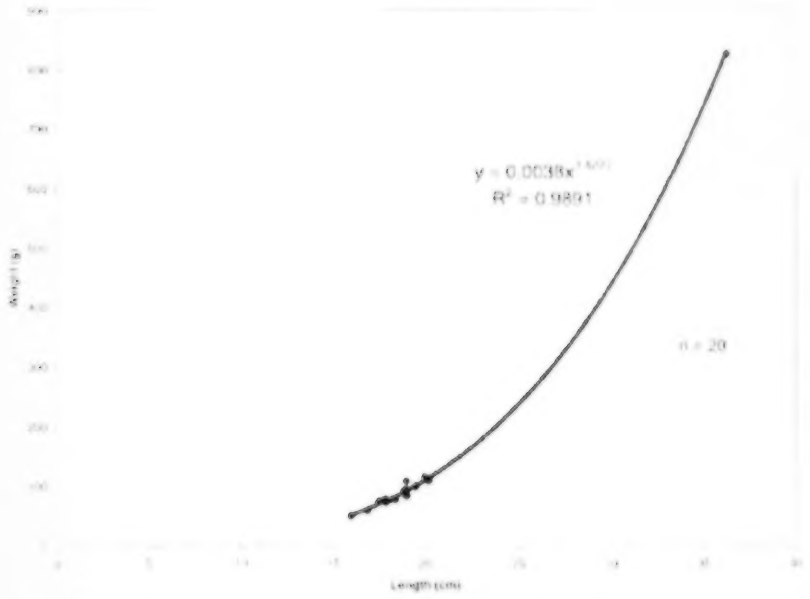

Figure 7. Length versus weight of lake whitefish in Butternut Lake, 1999.

FISH STOCKING PROGRAM

Butternut Lake is currently providing a good recreational fishery. The only real problem is the spawnbound issue. Providing access for the fish to spawn in the outlet has many implications: reduced lake level, hatchery fish accessing native fish populations (conservation issue), outlet creek going subterranean and probably little to no flow present, no inlet streams present, and ultimately it is expensive to conduct habitat complexing. One simpler way of alleviating the spawnbound issue would be to change to a sterile (triploid) strain of fish. These fish do not develop gametes and would tend to grow larger without the gamete production. Therefore, with triploid fish, springtime fishing should produce a more enjoyable experience for anglers.

By stocking with sterile fish, the future population of 5 and 6-year-olds would probably tend to get larger. The lake appears that it could produce larger sized fish than what was captured during this stock assessment (i.e. many zooplankton and invertebrates present for food and also the presence of a large fish tail found at the boat launch). In addition, the current assessment on these captured fish indicates that they do not show any signs of stunting. As a result, the author recommends that the strain of fish be changed to a sterile stock to alleviate the spawnbound problem and provide for a better springtime fishing experience.

If the strain of fish put into Butternut Lake does switch to sterile fish for its next scheduled stockings (2001 and 2003), then it is recommended that the next assessment should be conducted in the summer of 2004 (after two stocking efforts).

LITERATURE CITED

Jesson, D.A. 1990. A reconnaissance survey of Butternut Lake. Peace/Williston Fish and Wildlife Compensation Program Report No. 99. 21pp plus appendices.

APPENDIX 1

Netting Record

Lake: **Butternut**

NETTING RECORD **June 24, 1999**

Mesh sizes experimental order: 25, 76, 51, 89, 38, 64 mm

NETTING SITE #1

Type:	Sinking monofilament gill net		
Date Set:	June 24, 1999	Time:	1015 hrs
Date Lifted:	June 24, 1999	Time:	1555 hrs
Net Dimensions:	Length: 91.4 m	Depth:	2.4 m
Shallow End Mesh Size:	25 mm	Depth: Substrate:	1.1 m organics over small gravel
Deep End Mesh Size:	64 mm	Depth: Substrate:	8.0 m unknown

Comments:

Set in the same location as the first net set as the 1990 survey. Net was set and then checked at 11:45 (looked at the first two panels). Pulled out 10 RB, re-set net. Then processed captured fish. Checked net again at 13:20. Cleaned out entire net of fish. Net finally pulled at 15:55. Gill net #1 captured 58 rainbow trout (of which 7 had escaped), 17 lake whitefish (none escaped), and 5 longnose suckers (of which 2 escaped the net). Lake whitefish were captured between 10:15 and 13:20 (captured in a single school). With these fish, it was hard to identify their gonads (not very well developed). Their stomach contents had a lot of ooze (bottom material). One whitefish was taken as a voucher sample (later confirmed in the office as a "lake whitefish").

Lake: Butternut

NETTING RECORD **June 25, 1999**

Mesh sizes experimental order: 25, 76, 51, 89, 38, 64 mm

NETTING SITE #2

Type:	Sinking monofilament gill net		
Date Set:	June 25, 1999	Time:	1000 hrs
Date Lifted:	June 25, 1999	Time:	1315 hrs
Net Dimensions:	Length: 91.4 m	Depth:	2.4 m
Shallow End Mesh Size:	25 mm	Depth: Substrate:	1.0 m aquatic veg.
Deep End Mesh Size:	64 mm	Depth: Substrate:	8.9 m unknown

Comments:

Net was set in the same location as the second net set of the 1990 survey. Net was pulled 3.25 hours later. Gill net #2 captured 10 rainbow trout (1 escaped the net), 4 longnose suckers, and 3 lake whitefish.

APPENDIX 2

Individual Fish Data

Lake: Butternut

INDIVIDUAL FISH DATA

Date Captured: June 24, 1999
Gill Net #1

M - Male
F - Female
? - Not Obvious

IMM - Immature
MG - Maturing
MT - Mature
GV - Gravid
SP - Spent
? - Not Obvious

EG - Egg
ML - Milt
HD - Head
TG - Fish Tag
ST - Stomach

SC - Scale
FR - Fin Ray
OT - Otolith
WF - Whole Fish

Method of Capture: Sinking monofilament gill net.
Condition Factor (K) = $W / L^3 \times 100$
Ages with " " are adjusted ages.

Species	Fork Length (cm)	Weight (grams)	K	Gonadal Maturity	Sex	Age (yrs)	Stomach Contents					Comments
							Bottom Organisms	Plankton	Insects	Fish	Other	
RB	39.2	418	0.6939	?	?	"3"	released	alive				
RB	35.7	563	1.2374	MT	F	3	released	alive				
RB	38.1	664	1.2006	GV	F	3	released	alive				
RB	37.3	606	1.1677	GV	F	3	released	alive				
RB	41.8	927	1.2693	GV	F	5	released	alive				
RB	37.9	666	1.2234	GV	F	3	released	alive				
RB	38.9	709	1.2045	GV	F	5	dead				no	analysis
RB	42.5	1,040	1.3548	GV	F	"5"	dead					spawnbound
RB	37.1	772	1.5118	GV	F	3	dead					spawnbound
RB	41.5	808	1.1305	?	?	3	released	alive				
RB	39.7	766	1.2242	?	?	3	released	alive				
RB	36.5	601	1.2359	GV	F	"3"	released	alive				
RB	35.0	522	1.2175	GV	F	3	released	alive				
RB	40.0	619	0.9672	GV	M	"3"	released	alive			milt	expressed
RB	41.8	927	1.2693	?	7	"5"	released	alive			silver	bright
RB	39.7	742	1.1859	MT	M	3					full	detritus
RB	37.0	597	1.1786	GV	F	3						empty
RB	38.4	742	1.3104	GV	F	"3"	bottom	ooze				
RB	35.9	532	1.1498	MG	F	"3"	empty					
RB	35.1	536	1.2395	GV	F	"3"	empty				T.W.	spawnbound

Ch. chaoborus
Cl. clams
G. gammarus
Le. leeches
P.M. phantom midge
O.M. organic matter
L. lice
T.W. tapeworms
S. snails
M. mayflies (general)
Da. daphnia
Di. diptera
Ca. callibaetis

Lake: Butternut

INDIVIDUAL FISH DATA

Date Captured: June 24, 1999
Gill Net #1

M - Male
F - Female
? - Not Obvious

IMM - Immature
MG - Maturing
MT - Mature
GV - Gravid
SP - Spent
? - Not Obvious

EG - Egg
ML - Milt
HD - Head
TG - Fish Tag
ST - Stomach

SC - Scale
FR - Fin Ray
OT - Otolith
WF - Whole Fish

Method of Capture: Sinking monofilament gill net.
Condition Factor (K) = $W / L^3 \times 100$ Ages with " " are adjusted ages.

Species	Fork Length (cm)	Weight (grams)	K	Gonadal Maturity	Sex	Age (yrs)	Stomach Contents					Comments
							Bottom Organisms	Plankton	Insects	Fish	Other	
RB	40.3	714	1.0909	GV	F	"3"	G.		winged			T.W.
RB	41.5	889	1.2438	MG	F	3	G.				T.W.	full
RB	37.5	724	1.3729	MG	?	"3"	G.					silver
RB	15.4	37.4	1.0240	IMM	F	1	green	ooze				
RB	13.6	28.8	1.1449	IMM	F	1						unknown
RB	14.0	30.3	1.1042	IMM	F	1	G.		winged			
RB	14.5	32.2	1.0562	IMM	F	1	green	ooze	winged			mosquitos
RB	13.1	24.3	1.0809	IMM	F	1	G.					
RB	14.0	29.7	1.0824	IMM	F	1	G.	green	ooze			
RB	15.0	40.2	1.1911	IMM	F	1						detritus
RB	15.1	35.6	1.0340	IMM	F	1						unknown
RB	13.6	27.0	1.0734	IMM	F	1	G.		?			
RB	15.4	34.8	0.9528	IMM	F	1			winged			
RB	14.3	29.7	1.0157	IMM	F	1	G.					
RB	14.7	35.7	1.1239	IMM	F	1	G.	green	ooze			mosquito
RB	12.8	22.7	1.0824	IMM	F	1			winged			4 total
RB	14.1	29.7	1.0595	IMM	F	1	green	ooze				
RB	12.7	20.2	0.9861	IMM	F	1						empty
RB	39.2	664	1.1023	GV	F	3	released	alive				
RB	43.8	1,002	1.1925	GV	F	5	released	alive				

Ch.	chaoborus	P.M.	phantom midge	T.W.	tapeworms	Da.	daphnia
Cl.	clams	O.M.	organic matter	S.	snails	Di.	diptera
G.	gammarus	L.	lice	M.	mayflies (general)	Ca.	callibaetis
Le.	leeches						

Lake: **Butternut**

INDIVIDUAL FISH DATA

Date Captured: June 24, 1999
Gill Net #1

M - Male, F - Female, ? - Not Obvious
IMM - Immature, MG - Maturing, MT - Mature, GV - Gravid, SP - Spent, ? - Not Obvious
EG - Egg, ML - Milt, HD - Head, TG - Fish Tag, ST - Stomach
SC - Scale, FR - Fin Ray, OT - Otolith, WF - Whole Fish

Method of Capture: Sinking monofilament gill net.
Condition Factor (K) = $W / L^3 \times 100$ Ages with " " are adjusted ages.

Species	Fork Length (cm)	Weight (grams)	K	Gonadal Maturity	Sex	Age (yrs)	Stomach Contents					Comments
							Bottom Organisms	Plankton	Insects	Fish	Other	
RB	42.1	957	1.2825	?	?	"5"	released	alive				silver
RB	36.0	567	1.2153	GV	F	3	released	alive				
RB	36.8	596	1.1959	GV	F	3	released	alive				
RB	38.9	737	1.2520	GV	F	"3"	released	alive				
RB	38.5	676	1.1846	GV	F	5	released	alive				
RB	40.0	797	1.2453	G	F	"5"	dead	empty				spawnbound
RB	38.0	635	1.1572	GV	F	3	dead	empty				
RB	16.7	47.4	1.0177	IMM	?	"1"	assume	age	1		no	analysis
RB	14.0	27.9	1.0168	IMM	?	"1"	assume	age	1		no	analysis
RB	14.1	31.2	1.1130	IMM	?	"1"	assume	age	1		no	analysis
RB	15.2	40.2	1.1447	IMM	?	"1"	assume	age	1		no	analysis
LNS	13.5	26.3	1.0689								no	analysis
LNS	12.6	22.0	1.0998								no	analysis
LNS	13.0	23.6	1.0742								no	analysis
LW	20.2	109.2	1.3249	?	?	2	G.					
LW	17.9	73.0	1.2728	?	?	2	orange	zoo.	?			
LW	19.5	98.5	1.3284	?	?	2				1	white	worm
LW	20.2	107.8	1.3079	?	?	2						empty
LW	18.9	91.5	1.3553	?	?	2	green	ooze				
LW	17.7	75.1	1.3543	?	?	2	G.					

Ch. chaoborus
Cl. clams
G. gammarus
Le. leeches
P.M. phantom midge
O.M. organic matter
L. lice
T.W. tapeworms
S. snails
M. mayflies (general)
Da. daphnia
Di. diptera
Ca. callibaetis

Lake: **Butternut**

INDIVIDUAL FISH DATA

Date Captured: June 24, 1999
Gill Net #1

M - Male, F - Female, ? - Not Obvious
IMM - Immature, MG - Maturing, MT - Mature, GV - Gravid, SP - Spent, ? - Not Obvious
EG - Egg, ML - Milt, HD - Head, TG - Fish Tag, ST - Stomach
SC - Scale, FR - Fin Ray, OT - Otolith, WF - Whole Fish

Method of Capture: Sinking monofilament gill net.
Condition Factor (K) = $W / L^3 \times 100$ Ages with " " are adjusted ages.

Species	Fork Length (cm)	Weight (grams)	K	Gonadal Maturity	Sex	Age (yrs)	Stomach Contents					Comments
							Bottom Organisms	Plankton	Insects	Fish	Other	
LW	19.0	85.5	1.2465	?	?	2	G.	winged				
LW	19.0	94.9	1.3836	?	?	2						empty
LW	16.0	49.1	1.1987	?	?	2						empty
LW	17.9	77.3	1.3478	?	?	2	G.					
LW	19.0	82.7	1.2057	?	?	2	green	ooze				
LW	16.9	57.9	1.1996	?	?	2				1	white	worm
LW	20.0	114.4	1.4300	?	?	3	orange	ooze				
LW	18.9	91.3	1.3523	?	?	2	orange	ooze				
LW	17.5	72.5	1.3528	?	?	2	green	ooze				
LW	19.0	107.5	1.5673	?	?	2		3	winged			
LW	18.0	74.4	1.2757	?	?	2	voucher	sample	taken			

Ch.	chaoborus	P.M.	phantom midge	T.W.	tapeworms	Da.	daphnia
Cl.	clams	O.M.	organic matter	S.	snails	Di.	diptera
G.	gammarus	L.	lice	M.	mayflies (general)	Ca.	callibaetis
Le.	leeches						

Lake: **Butternut**

INDIVIDUAL FISH DATA

Date Captured: June 25, 1999
Gill Net #2

M - Male, F - Female, ? - Not Obvious
IMM - Immature, MG - Maturing, MT - Mature, GV - Gravid, SP - Spent, ? - Not Obvious
EG - Egg, ML - Milt, HD - Head, TG - Fish Tag, ST - Stomach
SC - Scale, FR - Fin Ray, OT - Otolith, WF - Whole Fish

Method of Capture: Sinking monofilament gill net.
Condition Factor (K) = $W / L^3 \times 100$
Ages with " " are adjusted ages.

Species	Fork Length (cm)	Weight (grains)	K	Gonadal Maturity	Sex	Age (yrs)	Stomach Contents					Comments
							Bottom Organisms	Plankton	Insects	Fish	Other	
RB	41.1	706	1.0169	GV	M	"3"	released	alive				
RB	39.5	688	1.1163	GV	F	"3"	released	alive				
RB	41.0	777	1.1274	GV	F	"3"	released	alive				
RB	38.0	625	1.1390	GV	F	3	released	alive				
RB	37.0	604	1.1924	GV	F	3	released	alive				resorbing
RB	42.0	890	1.2013	GV	F	5	G.					dead
RB	42.0	755	1.0191	SP	F	"3"	full	of	worms			dead
RB	42.0	955	1.2890	MG	F	5	bottom	ooze				silver
RB	40.5	862	1.2976	MG	F	5	green	ooze			T.W.	silver
LW	36.2	824	1.7370	MG	F	5	full	of	worms			dead
LW	18.4	77.1	1.2377	IMM	?	2	full	of	worms			dead
LW	18.9	88.4	1.3094	IMM	?	2	full	of	worms			dead
LNS	39.0										no	analysis
LNS	38.0										no	analysis
LNS	45.0										no	analysis
LNS	11.5										no	analysis

Ch. chaoborus
Cl. clams
G. gammarus
Le. leeches
P.M. phantom midge
O.M. organic matter
L. lice
T.W. tapeworms
S. snails
M. mayflies (general)
Da. daphnia
Di. diptera
Ca. callibaetis

Lake: **Butternut**

INDIVIDUAL FISH DATA

Date Captured: June 25, 1999

M - Male
F - Female
? - Not Obvious

IMM - Immature
MG - Maturing
MT - Mature
GV - Gravid
SP - Spent
? - Not Obvious

EG - Egg
ML - Milt
HD - Head
TG - Fish Tag
ST - Stomach

SC - Scale
FR - Fin Ray
OT - Otolith
WF - Whole Fish

Method of Capture: Angling.

Condition Factor (K) = $W / L^3 \times 100$

Ages with " " are adjusted ages.

Species	Fork Length (cm)	Weight (grams)	K	Gonadal Maturity	Sex	Age (yrs)	Stomach Contents					Comments
							Bottom Organisms	Plankton	Insects	Fish	Other	
RB	38.7	624	1.0766	GV	F	"3"	released	alive				

Ch.	chaoborus	P.M.	phantom midge	T.W.	tapeworms	Da.	daphnia
Cl.	clams	O.M.	organic matter	S.	snails	Di.	diptera
G.	gammarus	L.	lice	M.	mayflies (general)	Ca.	callibaetis
Le.	leeches						

Lake: **Butternut**

INDIVIDUAL FISH DATA

Date Captured: July 2 & 3. 1999

M - Male, F - Female, ? - Not Obvious

IMM - Immature, MG - Maturing, MT - Mature, GV - Gravid, SP - Spent, ? - Not Obvious

EG - Egg, ML - Milt, HD - Head, TG - Fish Tag, ST - Stomach

SC - Scale, FR - Fin Ray, OT - Otolith, WF - Whole Fish

Method of Capture: Angling.

Condition Factor (K) = $W / L^3 \times 100$

Ages with " " are adjusted ages.

Species	Fork Length (cm)	Weight (grams)	K	Gonadal Maturity	Sex	Age (yrs)	Stomach Contents					Comments
							Bottom Organisms	Plankton	Insects	Fish	Other	
RB	40.0	?		MG	F	3	detritus					dead
RB	40.0	?		?	?	?	released	alive				
RB	50.0	?		GV	M	6	released	alive				
RB	44.O	?		MG	F	3	unknown	food				dead
RB	44.O	?		MG	F	3	green	ooze				dead
RB	43.0	?		MG	F	"3"	4 dragon	flies				dead
RB	42.0	?		?	?	5	released	alive				silver
RB	40.0	?		?	?	3	released	alive				silver
RB	38.0	?		GV	F	3	released	alive				

Did not have a scale to record the weight of the fish while angling.

Ch.	chaoborus	P.M.	phantom midge	T.W.	tapeworms	Da.	daphnia
Cl.	clams	O.M.	organic matter	S.	snails	Di.	diptera
G.	gammarus	L.	lice	M.	mayflies (general)	Ca.	callibaetis
Le.	leeches						

Lake: **Butternut**

Mean condition factor by age group for rainbow trout (n = 61).

age	sample number	mean condition factor
1	19	1.0686
2	0	n/a
3	31	1.1675
4	0	n/a
5	11	1.2537
6	1	Unknown

Mean condition factor by age group for lake whitefish (n = 20).

age	sample number	mean condition factor
1	0	n/a
2	18	1.3123
3	1	1.4300
4	0	n/a
5	1	1.7370
6	0	n/a

General Comments:

- Ages for rainbow trout have been "adjusted".
- Average condition factor for all rainbow trout excluding age 1 fish = 1.1799 (n = 42).
- Average condition factor for all lake whitefish = 1.3394 (n = 20).
- Of the 20 lake whitefish captured in this survey, all but one were about the same size (average of 18 cm fork length). The one other fish was twice as large (36 cm fork length) as the others.

AGE DETERMINATION COMPLETED BY:

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